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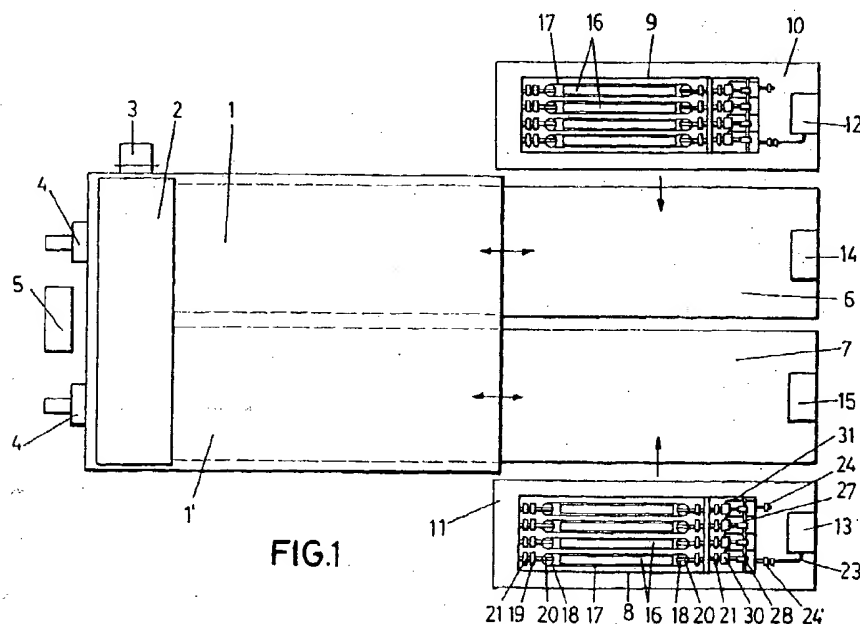
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(54) **Apparatus for methods of decorating metal sections**

(57) Designed to carry out a method of transferring the ornamental designs produced on a tubular bag or transfer pattern, within which the section to be decorated is accommodated, a vacuum being applied to the said bag during a phase of heat treatment within an oven, comprising an oven in which two laterally adjacent chambers (1-1') are provided, equipped with respective seatings (6) and (7) which enter the oven in its lower region and which project substantially therefrom, to an extent corresponding to the length of the sections, each seating being intended to receive a frame (8-9) from a

pair of auxiliary tables (10) and (11) on which the loading and unloading of the said sections (16), with their corresponding bags (17), takes place, to which bags the vacuum is applied by coupling their ends to two guides (18) through which vacuum tubes (20) pass, on which vacuum tubes sealing sleeves (19) and opening/closing keys (21) are mounted, the vacuum tubes (20) initially being connected to vacuum pumps (12) and (13) situated on the tables (10) and (11), and subsequently being connected to vacuum pumps (14) and (15) situated on the seatings (6) and (7).



Description

OBJECT OF THE INVENTION

[0001] The present invention relates to an apparatus that has been specifically designed to perform the ornamentation or decoration of metal workpieces, especially sections of substantial length, preferably of aluminium, although obviously the said apparatus permits the ornamentation of any other similar type of semifinished product obtained by extrusion or drawing.

[0002] More specifically, it is an object of the said apparatus to perform the surface decoration of the above-mentioned sections or workpieces, with finishes that faithfully represent the appearance of different materials such as wood, marble and others.

BACKGROUND OF THE INVENTION

[0003] One of the conventional solutions for the colouring or decoration of metal sections, specifically aluminium alloy-based sections, comprises using very complex and costly electrocolouring methods, or methods based on transferring a monochrome or polychrome drawing, produced on paper, to a flat metal surface by means of the combined action of pressure and temperature on a hot calender roll. This latter solution is perfectly valid for decorating flat surfaces, but is nevertheless impossible to apply to workpieces of complex shape or to surfaces of extruded sections where, logically, various faces thereof need to be decorated, which faces, moreover, are not flat in a high percentage of cases.

[0004] Attempting to circumvent this problem, the same applicant is the proprietor of the Spanish patent whose application number is P 9702228, in which a procedure is described for painting and/or decorating metal sections, together with a system for the implementation of the procedure, which starting from the basic technology of transferring designs based on monochrome or polychrome patterns produced on an aluminium/plastic paper base or the like to the said sections by the combined action of pressure and temperature, provided that the said pressure was applied to the sections forming a leaktight chamber, based on two rubber membranes, which leaktight chamber was connected to a vacuum pump, in order to achieve adaptation of the rubber membranes to the sections and, consequently, the transfer of the designs existing on the paper base, by pressing the said base against the sections under the action of the vacuum applied to the rubber membranes, this assembly subsequently being introduced into an oven to complete the thermal transfer, together with the pressure applied by the rubber membranes.

[0005] This solution poses a problem which fundamentally focuses on the following aspects:

- Given that a large number of sections are intro-

duced between the two rubber membranes, the system is effective on two opposed faces of the said sections, even though these are substantially irregular, but the pressure is very difficult to apply, or cannot be applied at all, to the other two faces, so that the results achieved are acceptable only in respect of the decoration of metal sections in which only the finish of one of their faces, or of two opposed faces, is of critical importance.

- The said rubber membranes, with their corresponding accessories, form a complex and therefore costly structure, which has adverse effects on production costs.

- The said rubber membranes, which have to be of substantial thickness to withstand the forces to which they are to be subjected, act by their very nature as a heat barrier within the oven, in other words act as an insulation, which makes it necessary to raise the temperature of the oven or raise the residence time of the sections therein, so that each of the two options again has adverse effects in terms of costs.

- After the adaptation of the transfer pattern or support to the sections, the method is concealed from the observer by the actual rubber membranes, so that there is no possibility of visual monitoring of the said transfer patterns, as far as the definitive adaptation thereof to the sections by the action of pressure is concerned, which in turn prevents possible problems of this type being corrected at the outset, such problems only being detected in the finished product, requiring the latter to be rejected.

[0006] In order to solve this problem, the same applicant has conceived a procedure for decorating metal sections which, based on the conventional use of transfer patterns comprising an aluminium/plastic laminate or the like bearing monochrome and polychrome patterns which are transferred to the sections by means of simultaneous application of pressure and heat, comprises forming a tubular bag with the said transfer pattern for each of the metal sections, which bag is hermetically sealed and is coupled by its ends to a vacuum source, in a manner such that perfect adaptation thereof to the four faces of the section is achieved, irrespective of whether the said faces are flat or otherwise, this vacuum situation being maintained in each individual bag throughout its passage through the oven in which the final transfer of the patterns takes place.

DESCRIPTION OF THE INVENTION

[0007] The apparatus according to the invention has been specifically designed for the implementation of the procedure mentioned in the final paragraph of the preceding section.

[0008] For this purpose, and more specifically, the oven, which from the standpoint of heat application is sim-

ilar to that used in the conventional procedures, with its associated burner, blowers and control panel, in which two laterally adjacent chambers are provided so that a seating of a length approximately twice that of the oven interacts with the oven, receives via the said seating a frame bearing a series of sections, duly encapsulated within respective bags, to which a vacuum has previously been applied, this frame initially being located on a table arranged laterally relative to the seating, which, on completion of the phase of introduction of the sections into the bags and application of vacuum thereto, gains access to the seating which subsequently moves on the latter until it is located below the oven and finally arrives within the latter, following which the operating cycle is reversed to return to the initial position on the auxiliary table, where the now finished sections or workpieces are removed and replaced by others.

[0009] According to another of the features of the invention, provision has been made for the oven to incorporate two laterally adjacent chambers and be equipped with two seatings, with their corresponding auxiliary tables, in order to increase the operational throughput of the apparatus, so that while one of the auxiliary tables is waiting to receive the appropriate charge of sections from the interior of the oven, a new set of sections can be installed on the other, so that the operation of the oven is virtually continuous, since immediately after the removal therefrom of a set of sections or workpieces it is possible to proceed with the introduction of a new set, so that the downtimes of the apparatus are virtually zero.

[0010] Arranged within each frame and in alignment with each section or workpiece to be decorated are two guides for the ends of the bag or transfer pattern upon which respective sealing sleeves act, these sealing sleeves connecting the said bags, preferably by both ends, to a vacuum tube located at the periphery of the frame, each of these sleeves being equipped with a key for opening, closing and regulating the vacuum pressure, and one of them being equipped with a stretcher for the bags or transfer patterns which, with the aid of a lever, a thrust shaft and a yoke, pulls the bags or transfer patterns to extend them appropriately, a connector being provided in this second sealing sleeve which, via an auxiliary sleeve, allows the removable connection thereof to the surrounding vacuum tube, which is associated with the corresponding vacuum pump via a valve, one vacuum pump being provided for each frame on the corresponding auxiliary table and on the seating corresponding thereto, so that the first thereof acts during the assembly phase in which the visual monitoring of the adaptation of the bags or transfer patterns to the sections take place, while the other acts during the heating phase within the oven, for which purpose a second connector is provided in the perimetral vacuum tube of the frame, having its corresponding valve, which enables one vacuum source to be replaced by another.

[0011] In accordance with another of the features of the invention, and according to a practical embodiment

thereof, provision has been made to enable the said frames to swing through an angle of 90° so that, with the sections maintaining their horizontal situation, they come to lie one above the other within each frame, which brings a number of advantages basically focused on the following points:

- The said seating providing oven access to the sections is eliminated and replaced by a bridge member arranged in the upper level of the oven, from which the frame is directly suspended, with the possibility of sliding along the latter.
- The manipulation functions for loading and unloading the sections take place in a vertical plane, which enables a larger number of sections to be arranged on the frame in comfortable working conditions for the operatives.
- The reduced occupation of space by each frame in the transverse direction, resulting from its own vertical orientation, makes it possible to increase the number of frames for the same width of oven and enables operatives to work outside and between frames, taking advantage in this latter case of the empty spaces left by those frames which are located within the oven and which are arranged alternately relative to those in the loading and unloading situations.

[0012] In accordance with another of the improvements according to the invention, provision has been made for each frame to have upper rotating supports by means of which it is suspended from the corresponding bridge member, which supports are interconnected by means of a rack or some other means of traction which allows the said frames to be driven for the purposes of entering and leaving the oven.

[0013] Provision has also been made for the means for applying the vacuum to the transfer patterns to act exclusively on the outer edge thereof, which structurally simplifies the apparatus while simultaneously preventing the said means from entering the oven and being affected by the temperature of the latter.

DESCRIPTION OF THE DRAWINGS

[0014] To supplement the description being given, and with a view to assisting better comprehension of the features of the invention, in accordance with a preferred example of a practical embodiment thereof, a set of drawings is attached as an integral part of the said description, in which drawings, for purposes of illustration and without implying any limitation, the following have been shown:

Figure 1 shows a diagrammatic plan view of an apparatus for methods of decorating metal sections produced in accordance with the object of the present invention.

Figure 2 shows, again in a diagrammatic plan view, one of the auxiliary tables of the apparatus, with its corresponding frame, in which, in the interests of greater clarity of the drawing, only one of the sections has been shown, together with its corresponding bag or transfer pattern and the likewise corresponding mechanisms for applying a vacuum thereto.

Figure 3 shows a diagrammatic lateral elevation of an apparatus according to the second form of practical embodiment of the invention.

Figure 4 shows another diagrammatic view, this time a plan view, of the same assembly as in the previous figure.

PREFERRED EMBODIMENT OF THE INVENTION

[0015] On examination of the figures described, it is possible to see that the recommended apparatus includes an oven in which two laterally adjacent chambers (1-1') or zones are provided, terminating at one of their ends in a single combustion chamber (2), equipped with the corresponding burner (3), a pair of blowers (4) and a control panel (5), two parallel seatings (6) and (7) being provided at the lower level of the oven as such (1-1') and projecting substantially beyond the oven (1) opposite the blowers (4), in which seatings will be located two frames (8) and (9) coming from respective auxiliary tables (10) and (11) situated on both sides of the seatings (6) and (7), in the zone thereof projecting from the oven (1), on which tables the actions of loading and unloading the sections take place, as will be seen in due course, together with, especially, the application of vacuum to the bags or transfer patterns in which the sections are accommodated, with the assistance of vacuum pumps (12) and (13), other vacuum pumps (14) and (15) also existing at the free end of the seatings (6) and (7).

[0016] More specifically, each frame (8) is intended to receive a plurality of sections (16), in parallel lengthwise arrangement, which sections are introduced into respective bags or transfer patterns (17), as may be seen especially in Figure 2, in which only one of the said sections (16) has been shown, as was stated previously, in the interests of greater clarity of drawing, since the structure thereof is repeated for all the remainder, each bag or transfer support (17) being equipped with a guide (18) that can be coupled to each end thereof, with which guide interacts a sealing sleeve (19) through which passes a vacuum tube (20) having a key (21), the vacuum tubes (20) being connected to a perimetral vacuum tube (22) which acts on each of the frames (8) and (9), and which is initially connected to the vacuum source (12-13), when the frames (8-9) are located on the tables (10) and (11), and is connected to the vacuum pumps (14) and (15) when the said frames (8) and (9) move into position on the seatings (6) and (7), the ducts (23) which connect these members being provided for this purpose with valves (24-24') and connectors (25-25')

that allow the said exchange of vacuum source when the frames are moved from the tables to the seatings.

[0017] Each frame (8-9) additionally incorporates, in alignment with one of the ends of the bags or transfer patterns (17), a stretcher (26) for the latter, with a view to improving the conditions of adaptation to the respective sections (16), which stretcher (26) is actuated by a thrust shaft (27) which, via a cam (28) and a yoke (29), pulls the vacuum tube (20) to stretch the bag (17), a connector (30) being provided in this vacuum tube (20) and, via a flexible auxiliary sleeve (31), making it possible to maintain communication between the said vacuum tube (20) and the general and surrounding vacuum tube (22) despite the relative movement between these members.

[0018] Thus, and as stated previously, starting for example with the frame (9) situated under vacuum on the table (11), a series of sections (16) is formed on the said frame (9), these sections being introduced into respective bags or transfer patterns (17), the said bags (17) then being coupled by their ends to the corresponding guides (18), the said ends being fixed with the assistance of the sealing sleeves (19) and the whole being subjected to a longitudinal stretching of the bags (17) by actuation of the thrust shaft (27), during which the vacuum is applied to the bag (17) by means of the vacuum source (13), connected at this time, via the connector (25') and the valve (24'), to the general surrounding vacuum tube (22) of the frame (9), as a result of which close adaptation of the bag (17) to the section (16) is achieved, which can be monitored visually and corrected in the event of any defect. Immediately subsequently, the valve (24') is closed, the connector (25') is uncoupled and the frame (9) moves transversely from the table (11) to the seating (7), where the latter is coupled to the vacuum source (15) by means of the connector (25), the valve (24) then opening so that the vacuum conditions in the bag (27) are perfectly maintained. In this position, the frame (9) moves on the seating (7) to the interior of the chamber (1') of the oven, where the heat treatment takes place at an appropriate temperature and also for an appropriate period, following which the frame is again returned, after completion of the process, to the free sector of the seating (7), from which it moves to the auxiliary table (11) in order to be unloaded.

[0019] The existence of a dual structure within the apparatus makes it possible to combine work on both auxiliary tables, in a manner such that, once the loading of a frame (9) has been completed, while the said frame is entering the oven (1) and the sections are being heat-treated, the other frame (8) can be used to prepare a new batch of sections, which will be ready to be introduced into the oven (1) as soon as the previous batch emerges therefrom, which involves, as stated previously, a substantial reduction of downtimes in the apparatus.

[0020] In the alternative practical embodiment shown in Figures 3 and 4, it can be seen that the corresponding

apparatus includes an oven (101), of a length appropriate to the sections (102) to be processed, so that the latter likewise have to access the interior of the oven in a horizontal orientation, expediently associated with a frame (103), which in the present case and in accordance with one of the features of the invention adopts a vertical orientation, so that the sections (102) associated therewith are positioned one above the other, adopting different respective vertical levels, as can be seen in Figure 1, each frame (103) being equipped with a plurality of rotating supports (104), distributed uniformly, which allow the displacement thereof within an imaginary vertical plane along a bridge member (105), which emerges from the bottom of the oven (101) to the exterior thereof by an amount sufficient to permit the frame (103) itself, as a whole, to be directly accessible outside the oven, in order to enable the operations of replacement of the sections (102) to be performed thereon after each treatment phase.

[0021] This longitudinal displacement of the frame (103), to enable it to enter and leave the oven (101), is performed with the participation of an appropriate drive member, such as for example a stepping motor (106), which acts on a rack (107), a chain or any other appropriate means expediently solidly fixed to the upper horizontal member of the frame (103) with which the supports (104) are associated.

[0022] For the rest, and as in the preceding case, each frame will incorporate leaktight sealing means (108) for the tubular body (109) forming the transfer patterns, within which the respective sections (102) are accommodated, and means (110) for applying the vacuum to the said transfer patterns (109), specifically with the aid of a vacuum pump (111) provided for each frame (103) and connected with the said means (110) via a hose (112) capable of moving with the frame (103) during its displacements, being equipped either with a conventional positioning chain or with an automatic winding drum (113) with which guides (114) interact.

[0023] As can be seen in Figure 3, the frame (103) only incorporates the said means (110) for applying a vacuum at the outer end of the transfer patterns (109), leaktight sealing means (108) alone for the latter existing at its inner end.

[0024] As can also be seen in the said Figure 3, the vertical orientation of the frame (103) allows a substantial number of sections (102) to be placed thereon without adversely affecting optimum working conditions for the operatives, this number of sections being much greater than can be arranged on the horizontal table of the former case, where the equivalent frame also adopts a horizontal orientation.

[0025] On the other hand, and as can be seen from a study of Figure 4, for an oven (101) of a predetermined width and with the two frames that it was possible to use in the previous case, a considerably larger number of frames can now be used, specifically six in the embodiment shown in the said figure, so that in parallel with

the substantial increase in the number of sections that are placed on each frame there is also a substantial increase in the number of frames involved in the apparatus, thus very substantially increasing the throughput thereof.

[0026] More specifically, and in accordance with the said practical example of embodiment shown in Figure 4, while three of the frames (103) involved in the apparatus, for example those occupying uneven positions, are located within the oven, the frames which occupy the even positions will be outside the oven, so that while the sections of the first group of frames are undergoing the heat treatment phase, the operations of removing the previously processed sections and replacing them with other new sections can conveniently be undertaken for the remaining frames.

[0027] With regard to the structure of each frame (103), provision has been made for at least one vertical upright (103) to be suspended from the upper movable structure formed by the rotating supports (104) and the rack (107), the said vertical upright(s) forming the support as such for the sections (102), the number of which will be a function of the length of the latter, this upright corresponding to its own reference (103) and being equipped with a plurality of lateral supports (115) for the respective sections, appropriately spaced, another vertical upright (116) being provided at the inner end of the frame to support the means (108) for the leaktight sealing of the corresponding end of the transfer patterns (109), while a structure (117) supporting the means for applying a vacuum is provided at the outer end of each frame, a description of this structure being unnecessary in that it is the same as that of the previous case.

Claims

1. Apparatus for methods of decorating metal sections, in which the said sections are introduced into bags forming the corresponding transfer patterns, which, after receiving the sections within them, are sealed by their ends, a vacuum being applied thereto to subject the said bags to a strong pressure against the walls of the section, which immediately thereafter is introduced into an oven for the permanent transfer to the sections of the ornamental designs existing on the transfer patterns, **characterized in that** two laterally adjacent chambers (1-1') or zones are provided in the oven, with access at the lower level, from which emerge respective seatings (6) and (7) which are extended beyond the said oven to an extent appropriate to the length of the sections or workpieces to be processed, a frame (9), supporting the sections (16) and the means for applying vacuum thereto, interacting with each of these seatings (6) and (7), while auxiliary tables (10) and (11) are provided on both sides of the seatings (6) and (7), where the operations of loading,

applying vacuum to and unloading each of the bags or transfer patterns (17) relating to the respective sections (16) are carried out.

2. Apparatus for methods of decorating metal sections according to Claim 1, **characterized in that** a pair of end guides (18) are provided in each frame (8-9), for each of the sections (16) to be processed, and more specifically for each of the bags or transfer patterns (17) relating thereto, which guides can be coupled to the ends of each tubular bag (17) and on which the said ends are sealed with the assistance of respective sealing sleeves (19), mounted in turn on respective vacuum tubes (20) which, by means of keys (21), are connected to an enclosing vacuum tube (22) provided on the periphery of the frame (8-9), this general vacuum tube (22) being equipped with a pair of valves (24-24') and with a pair of connectors (25-25') for connection/disconnection thereof to/from vacuum pumps (12) and (13) provided on the auxiliary tables (10) and (11) and, subsequently, to/from vacuum pumps (14) and (15) provided in turn at the free end of the sealings (6) and (7).
3. Apparatus for methods of decorating metal sections according to the preceding claims, **characterized in that** each frame (8-9) is provided, in line with one of the ends of the sections (16), with a stretcher (26) for the bags (17), acting prior to the application of vacuum thereto, and actuated by a thrust shaft (27) which, via a lever (28) and a yoke (29), acts on the vacuum tube (20) of each of the bags (17), a connector (30) being provided in the said vacuum tube (20) and, via a flexible sleeve (31), connecting it to the general, perimetral vacuum tube (22).
4. Apparatus for methods of decorating metal sections according to the preceding claims, **characterized in that** the general vacuum tube (22) of each frame (8-9) is coupled via the connectors (25') to the vacuum source (12-13) provided on each of the auxiliary tables (10-11) to allow the visual monitoring of the bags (17) on the sections (16), enabling possible fitting errors to be corrected, while the ultimate vacuum situation in which the said bags (17) arrive within the oven (1) is established by means of the vacuum pumps (14) and (15) situated on the sealings (6) and (7), following disconnection of the connectors (25') and subsequent connection of the connectors (25).
5. Apparatus for methods of decorating metal sections according to Claim 1, **characterized in that** the frames (103) adopt a vertical orientation, maintaining the sections (102) in a horizontal orientation and the displacement of the latter taking place, during the manoeuvre of introducing the sections into the

oven (101) and removing them therefrom, within the corresponding vertical plane within which they lie.

6. Apparatus for methods of decorating metal sections according to Claim 5, **characterized in that** each frame (103) is suspended, by means of a plurality of rotating supports (114), from a bridge member (105) which, from the bottom of the oven (101), reaches a point outside the latter and sufficiently remote therefrom to permit the frame (103) as a whole to be situated outside the oven (101) during the manoeuvres of loading and unloading the sections (102).
7. Apparatus for methods of decorating metal sections according to Claims 5 and 6, **characterized in that** the rotating supports (104) are solidly fixed to a rack (107) or similar transmission means which receives the drive of a stepping motor (106), by virtue of which the frame (103) as a whole enters within the oven (101) and emerges therefrom at the end of each treatment phase.
8. Apparatus for methods of decorating metal sections according to Claims 5, 6 and 7, **characterized in that** the said frame (103) involves one or more vertical uprights (103), equipped with lateral supports (115) for the respective sections (102), with their corresponding transfer patterns (109), the said frame additionally incorporating an upright (116) in line with its inner end, supporting the leaktight sealing means (108) for the end corresponding to the transfer patterns (109), while at its other end the said frame incorporates a structure (117) supporting the vacuum means (110) by means of which the vacuum is applied to the transfer patterns (109), exclusively by the outer end thereof, which vacuum means (110) are expediently connected to a vacuum pump (111).
9. Apparatus for methods of decorating metal profiles according to Claims 5 to 8, **characterized in that** the apparatus involves a plurality of frames (103), preferably an even number thereof, arranged in parallel, each of them being equipped with its own drive means and vacuum application means, in an arrangement wherein, while half of the said frames (103), in alternating positions, are located within the oven (101), during the heat treatment phase, the other half of the frames (103) are located outside the oven, in a situation where they are being loaded/unloaded.

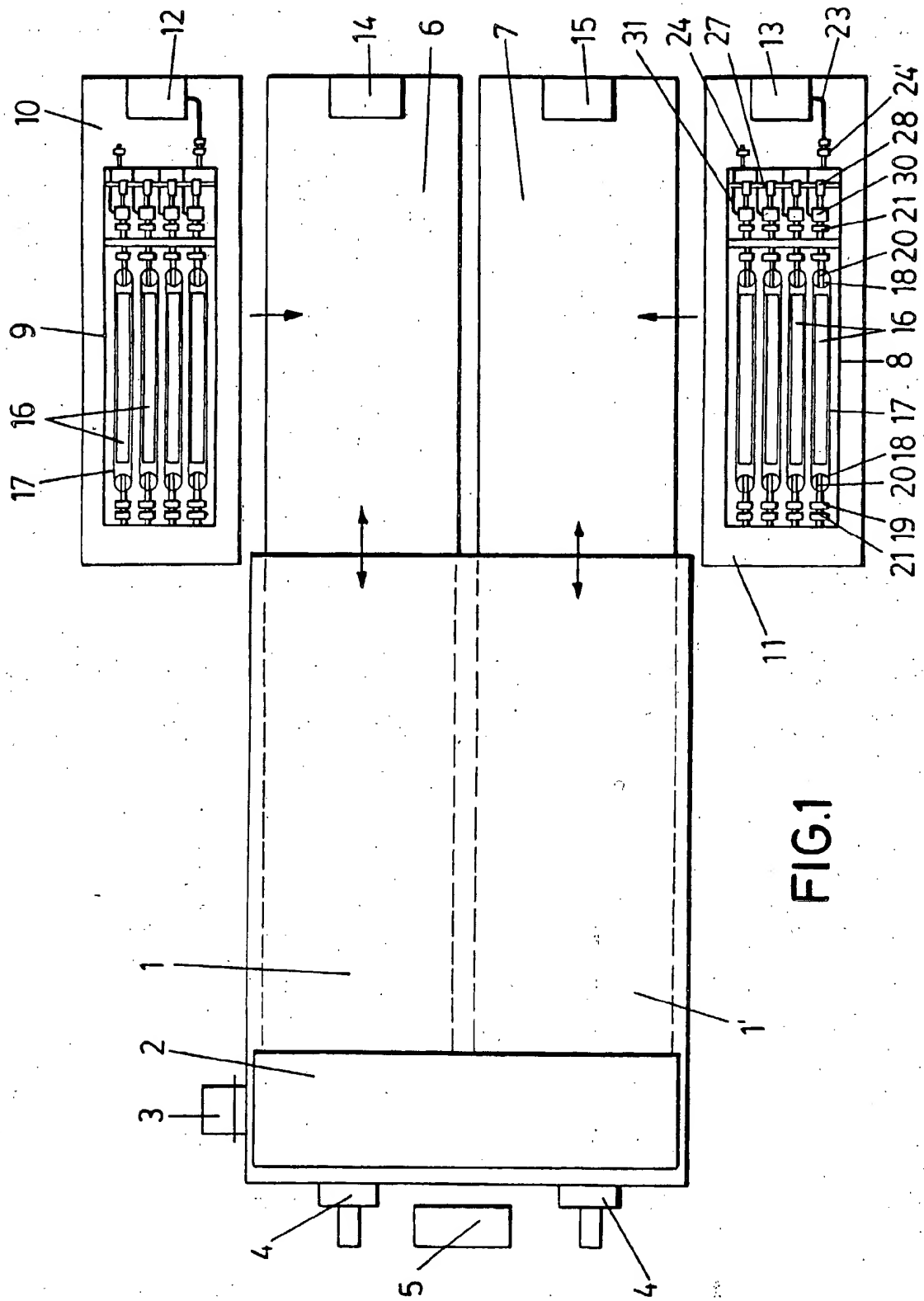


FIG.1

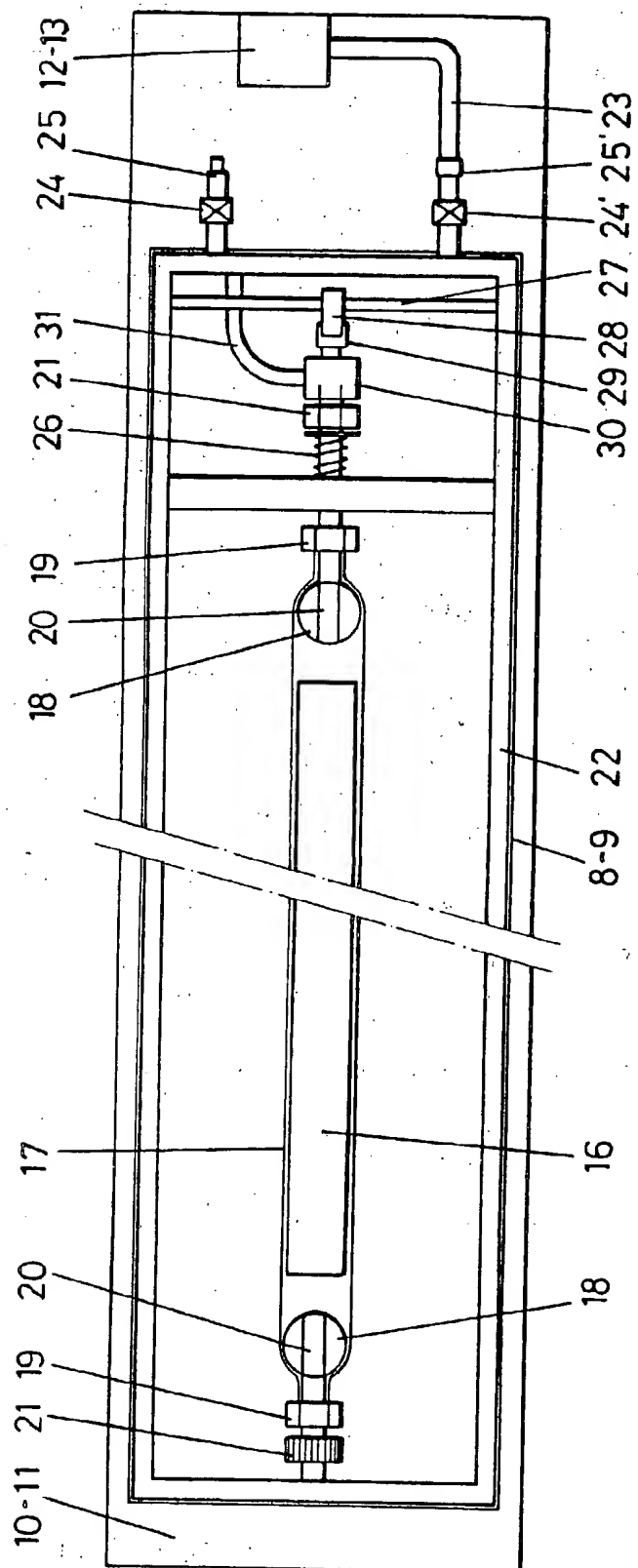
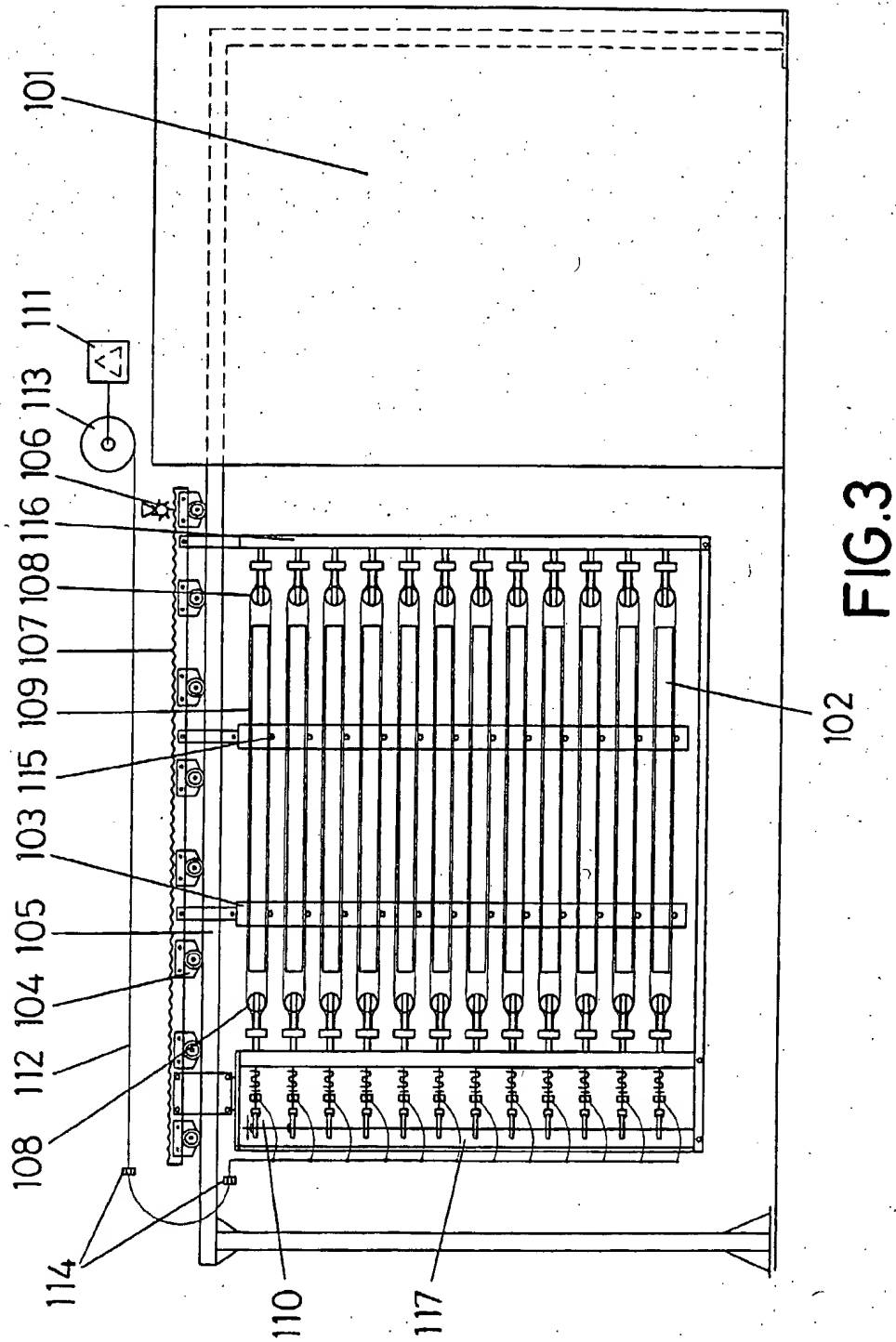


FIG. 2



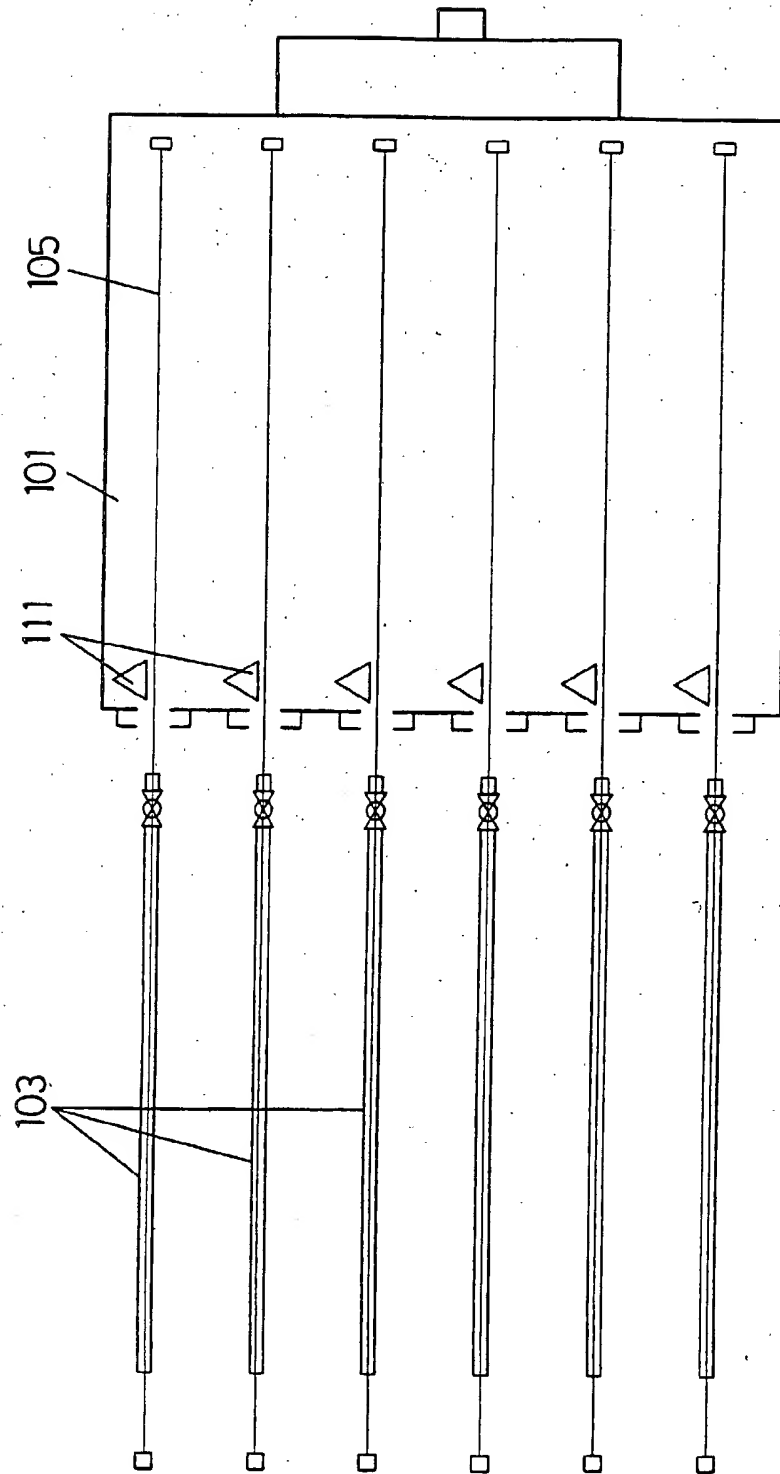


FIG.4